

***Pseudosinella maros* sp. n., a troglobitic Entomobryidae (Collembola) from Sulawesi Selatan, Indonesia**

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***Pseudosinella maros* sp. n., a troglobitic Entomobryidae (Collembola) from Sulawesi Selatan, Indonesia.** - The new species *Pseudosinella maros* sp. n. is described from caves of south Sulawesi. It exhibits clear troglomorphic features (absence of eyes and pigment, relatively large body size, elongate claw and antennae), and is restricted to oligotrophic habitats in the caves of the Maros karst, where it is abundant. It is the first true subterranean species of the genus recorded from Indonesia.

Keywords: New species - Collembola - Entomobryidae - Sulawesi - subterranean fauna.

INTRODUCTION

The Maros karst in Sulawesi Selatan province (Indonesia) is the richest hot-spot of subterranean biodiversity in the tropics (Deharveng & Bedos, 2000). Yet, most of its terrestrial fauna remains undescribed. Collembola are, comparatively to other Arthropods, not very diversified in the caves of Maros, but at least three species (one *Pararrhopalites*, one *Pseudosinella* and one *Coecoloba*) seem to represent true troglobites. The most highly evolved in terms of troglomorphy is the new species *Pseudosinella maros* described here, which is widespread in oligotrophic habitats of all caves of the area. This species is the first troglobitic Collembola described from Indonesia.

The genus *Pseudosinella* is highly diversified in temperate caves, but is much less frequent and poorly known in tropical caves, where *Coecobrya* (mostly on guano) and Paronellidae (mostly in oligotrophic habitats) tend to replace it.

ABBREVIATIONS USED IN THE TEXT

Material deposit: MHNG, Muséum d'histoire naturelle de Genève; MNHN, Muséum national d'Histoire naturelle de Paris; MZB, Museum Zoologicum Bogoriense.

Descriptions: Abd., abdominal segment; Ant., antennal segment; Th., thoracic segment; Tita, tibiotarsus.

SYSTEMATICS

Pseudosinella maros sp. n.

STUDIED MATERIAL

For the description and localisation of caves, see Deharveng & Bedos (1986) and Brouquisse (2002).

Holotype male. Indonesia: Sulawesi Selatan: Maros karst: Patunuang: Gua N1, 9/07/1986, P. Leclerc leg. (sample # INDO-194). Mounted on slide in Marc-André II and deposited in MZB.

Paratypes. Indonesia: Sulawesi Selatan: Maros karst: Patunuang: Gua N1, 9/07/1986, 7 ex., P. Leclerc leg. (sample # INDO-194) (2 specimens in MZB, 3 specimens in MNHN, 2 specimens in MHNG); Patunuang: Leang Bone Patunuang, 04/2002, 18 specimens, Rahmadi & Suhardjono leg. (12 specimens in MZB, 3 specimens in MNHN, 3 specimens in MHNG).

Other material. The species seems to be widespread in the Maros karst. However, it exhibits variability in claw elongation and antennal S-chaetotaxy, and it cannot be ruled out that specimens collected in underground systems north and south of the type localities may belong to closely related but different forms. We therefore did not consider the cave populations listed below as paratypes.

Indonesia: Sulawesi Selatan: Maros karst: Bantimurung: Gua Baharuddin, 7/07/1986, 1 ex., P. Leclerc leg. (sample # INDO-187); Bantimurung: Gua Bantimurung, 8/07/1986, 9 ex., P. Leclerc leg. (sample # INDO-189); Bantimurung: Gua Mimpì, 1/07/1988, 1 ex., Deharveng leg. (sample # SULA-011); *ibid*, 04/2002, 2 ex., Rahmadi & Suhardjono leg.; Kappang: Gua K9, 11/07/1986, 1 ex., P. Leclerc leg. (sample # INDO-198); Samanggi: Gua Saripa, 04/2002, 113 ex., Rahmadi & Suhardjono leg.; Samanggi: Saripa spring cave, 24/08/2002, 3 ex., Bedos & Deharveng leg. (sample # SULS-344); Balangajea: Gua S1, 04/2002, 5 ex., Rahmadi & Suhardjono leg.

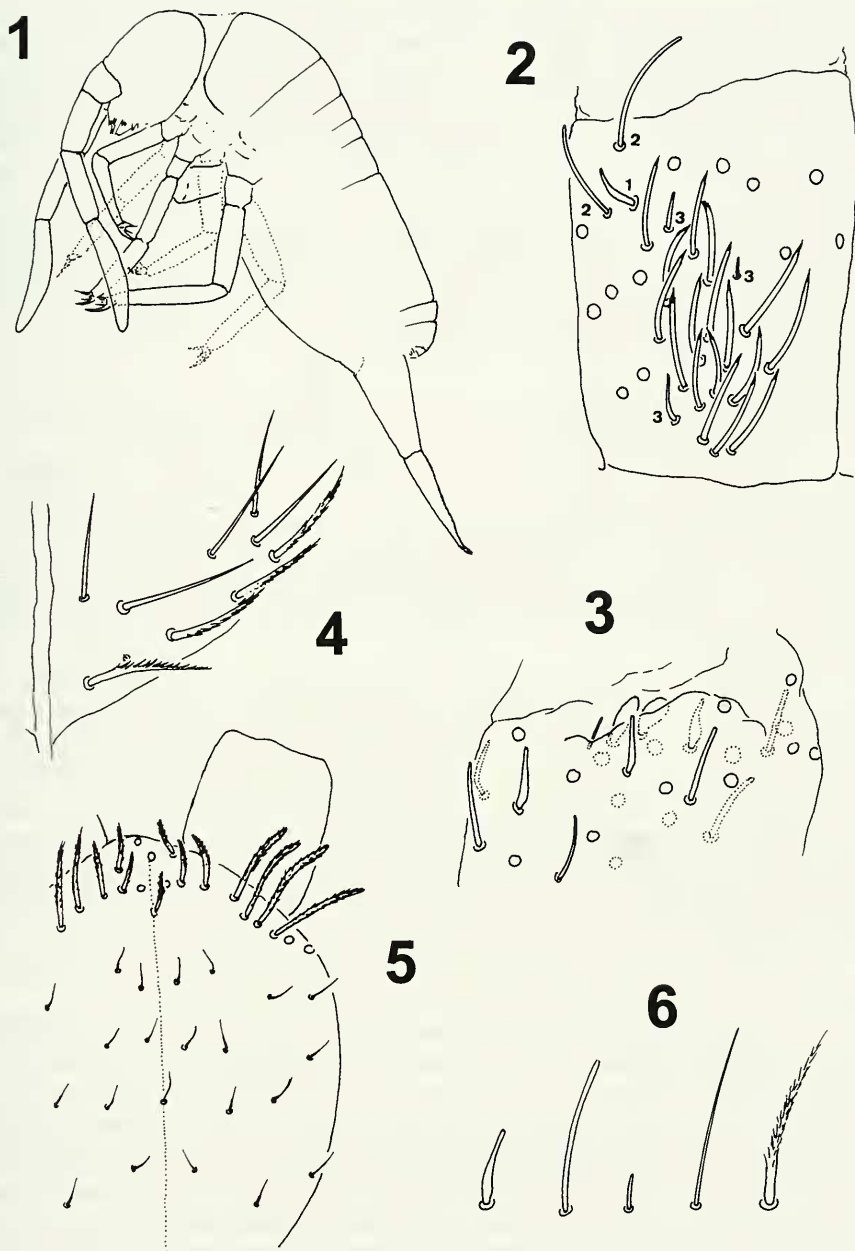
DISTRIBUTION

The species is restricted to caves of the southern part of the Maros karst.

DESCRIPTION

Body length 0.7 to 1.1 mm. White, blind. Antennae rather long, 1.65-2.05 times cephalic diagonal (Fig. 1).

Antennae. No scales. Ordinary chaetae densely and finely ciliated (Fig. 6). A few microchaetae at the basis of Ant. I (3 externo-basal, arranged in a triangle), Ant. II (one dorsal, one internal, one external), none seen on Ant. III and IV. S-chaetae smooth, of seven types: (1) medium-size, distinctly swollen with larger width at 1/4 to 1/2 of their length (Fig. 6); (2) long, thin, subcylindrical (Fig. 6); (3) short, thin, subcylindrical (Fig. 6); (4) swollen, oval (internal S-chaetae of Ant. III organ, Fig. 3); (5) subcylindrical, wider than type 1, rather long, tapered at the apex (sensorial field of Ant.



FIGS 1-6

Pseudosinella maros sp. n. 1, habitus in lateral view; 2, first antennal segment in ventral view (1, 2, 3: S-chaetae of types 1, 2, 3; other figured chaetae: ventral field of type 5 S-chaetae; circles: sockets of ordinary chaetae); 3, distal organite of Ant. III; 4, labial basis chaetotaxy; 5, dorsal chaetotaxy of head; 6, some types of antennal chaetae (from left to right: type 1, 2, 3, 6, and ordinary ciliated chaeta).

I, Fig. 2); (6) very thin, acuminate, straight, long (Fig. 6); (7) very thin, acuminate, straight, short. Types 1 to 3 more hyaline than ordinary chaetae, type 4 very hyaline, often difficult to distinguish, types 5 and 6 less hyaline and possibly not S-chaetae. Ant. I with S-chaetae of type 1 (2-3), type 2 (at least two ventro-distal), type 3 (at least three ventral) and type 5 (grouped in a conspicuous ventral sensorial field of 10-20 chaetae, in male and female, Fig. 2). Ant. II S-chaetae of type 1 (a few), and of type 2 (about 18-25 mostly ventral). Ant. III with S-chaetae of types 1, 2, 4 and 7 in the area of the organite (Fig. 3); one dorsal S-chaetae of type 1 and a few more of type (2) on other areas of Ant. III. Ant. IV with numerous S-chaetae of type 2, mainly ventro-external, some of types 1 and 3 mainly ventrally, and numerous dorso-external type 6 S-chaetae. No apical bulb. Subapical organite small, present.

Buccal region. Labium basis: MrEL1L2, with r extremely reduced (Fig. 4). Four ciliated prelabral chaetae.

Dorsal chaetotaxy. Dorsal macrochaetae R000/00/0201+1. The macrochaetae of abd. IV are P (near the anterior trichobothria) and M2 (postero-laterally to the pseudopore). Pattern of ordinary thin-smooth chaetae on head illustrated in Fig. 5. Abd. II chaetotaxic formula: -ABq1q2 (Fig. 9). Abd. IV: 5 triangular chaetae around anterior trichobothria of Abd. IV (S present) (Fig. 11). Ordinary chaetae similar to those of the antennae, finely ciliated. Typical S-chaetae very reduced in number, refringent (appear black contrary to ordinary chaetae), only seen laterally on Th. II (one long, Fig. 8) and Abd. I (one short).

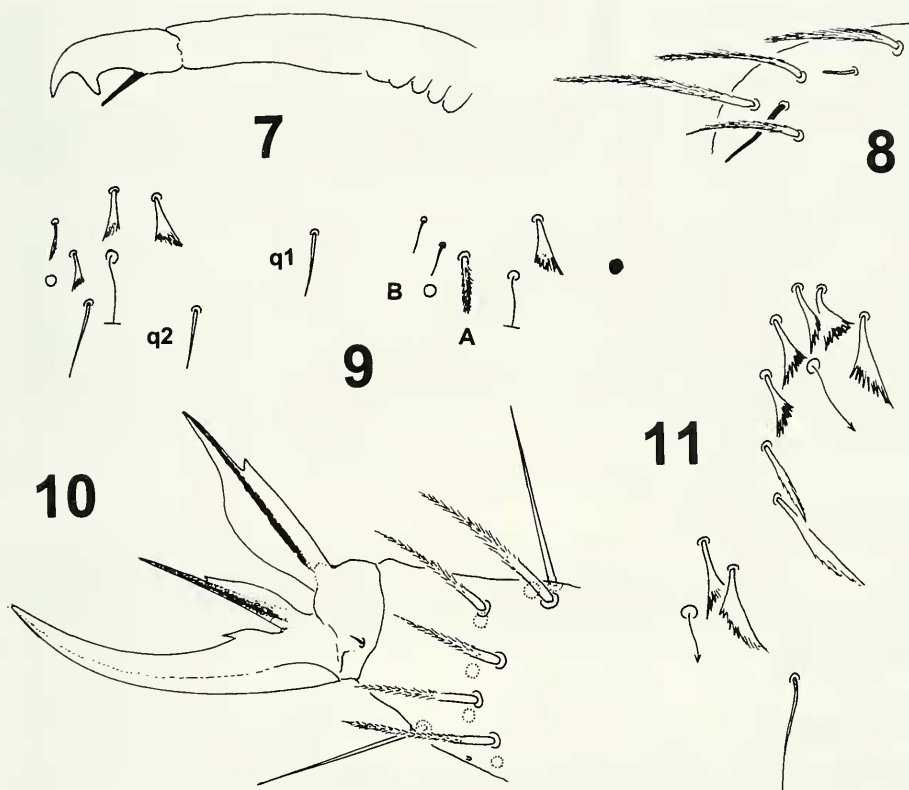
Legs. Claw long and thin (Fig. 10); without tooth on internal crest, but with a small basal hump or sometimes a small tooth at 1/5-1/6 of its length; an uneven lateral tooth in the form of a very long, narrow, acuminate wing inserted basally, with a minute external tooth at 60% from its crest basis. Empodial appendage 2/3 of claw III, moderately swollen, its internal crest smooth, its external crest with a strong tooth at the 1/3 from the apex. One distal tibiotarsal tenent hair, smooth and acuminate, hardly longer than closest chaetae. One subapical ventral chaeta smooth, thin and pointed. Other tibiotarsal chaetae thick and weakly ciliated. Ventro-basal tenent-hair of Tita hardly differentiated from other ordinary chaetae.

Ventral tube with 5+5 latero-distal smooth chaetae; 3+3 posterior long, thin, smooth or weakly ciliated; and 5-7+5-7 anterior, ciliated, long and thick.

Furca. Tenaculum with 4+4 teeth and a strong chaeta. Manubrium dorsally with two strips of thick, ciliated ordinary chaetae, and 4+4 (possibly 5+5?) long, thin, smooth and pointed chaetae spaced on two longitudinal lines; 6+6 dorso-distal thick ciliated chaetae surrounding 2+2 pseudopora; ventrally, 2+2 thick ciliated ventro-distal chaetae. Dens relatively short and stout, slightly shorter than manubrium, ventrally with scales, dorso-laterally with 3 or 4 ranks of thick ciliated chaetae, and with one long, thin, smooth and pointed chaeta dorso-basally. No basal tubercle. Mucro strong with a strong basal spine which reaches the basis of the proximal tooth of mucro or slightly more (Fig. 7).

ETYMOLOGY

The name refers to the region (the karst of Maros near the town of Maros) of the type locality, as a noun in apposition.



FIGS 7-11

Pseudosinella maros sp. n. 7, distal part of dens and mucro; 8, latero-distal chaetae of Th. II tergite (ordinary ciliated chaetae; a long, refringent S-chaeta; a shorter hyaline microchaeta); 9, Abd. II tergite chaetotaxy; 10, praetarsus and distal part of tibia of leg III (the internal part of the empodial appendage is often less swollen than on the drawing); 11, trichobothrial areas of Abd. IV.

DISCUSSION

Relationships. The new species has a unique combination of characters. The most outstanding feature is the conspicuous ventral sensorial field of Ant. I. Although grouping of S-chaetae ventrally on Ant. I is a trend observed in several species of *Pseudosinella* (see for instance *P. bessoni* in Deharveng, 1988), it is much less conspicuous and chaetae are less modified in the species described so far.

Pseudosinella maros is the first troglomorphic species described from the Sunda islands, and the second from Southeast Asia, after *P. chiangdaoensis* Deharveng, 1990 from Tham Chiang Dao in Thailand. This last species is not closely related to *P. maros* (labium with 2 chaetae M, dorsal macrochaetae as R000/22/0201+2).

The presence of only one M chaeta on labium basis is observed in very few species of the genus, among which *P. fujikakai* Yosii, 1964 is probably the most widespread. It differs from *P. maros* by its non-elongate claw, non-truncated empodial

appendage, and a more abundant macrochaetotaxy (0,0/0,3,0,1+3 according to Yoshii (1982), but the specimens of Hawaii described by Christiansen & Bellinger (1992) have usually only 1+1 on Abd. IV, like *P. maros*).

P. maros is also close to undescribed soil species of southern Sulawesi by most characters supposed to be not linked to subterranean life (reduced macrochaetotaxy, structure of the claw complex), while "adaptive" characters are clearly different (larger body size, thinner claw and longer appendages, see Deharveng, 1987).

Ecology. The new *Pseudosinella* is abundant in all caves of the Maros karst, where it lives in oligotrophic habitats. In Saripa cave, it was caught for instance in large number in baited traps placed on clay banks near the terminal lake, where no figured organic matter is present, but which are flooded each year. The gut of the new species was filled with mineral debris without recognizable mycelium or spores, as is often the case for cave species. *P. maros* is the main prey of small hunting spiders that are abundant in Saripa cave.

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REFERENCES

- BROUQUISSE, F. 2002. 4. Résultats spéléologiques (pp. 21-34). In: A.P.S. Toulouse (ed.). Expédition Maros 99, rapport spéléologique, 39 pp.
- CHRISTIENSEN, K. A. & BELLINGER, P. F. 1992. Collembola. *Insects of Hawaii* 15: 1-445.
- DEHARVENG, L. 1987. Collembolles cavernicoles et édaphiques de Sulawesi et des Moluques (Chapter 13, pp. 133-142). In: A.P.S. Toulouse (ed.). Expédition Thaï-Maros 86, rapport spéléologique et scientifique, 174 pp.
- DEHARVENG, L. 1988. Collembolles cavernicoles VII. *Pseudosinella bessonii* n. sp. et note sur l'évolution morphologique de la griffe chez les *Pseudosinella*. *Revue suisse de Zoologie* 95(1): 203-208.
- DEHARVENG, L. 1990. Fauna of Thai caves. II. New Entomobryoidea Collembola from Chiang Dao Cave, Thailand. *Bishop Museum Occasional Papers* 30: 279-287.
- DEHARVENG, L. & BEDOS, A. 1986. Les cavités des environs de Bantimurung (Chapter 10, pp. 81-95). In: A.P.S. Toulouse (ed.). Expédition Thaï-Maros 85, rapport spéléologique et scientifique, 215 pp.
- DEHARVENG, L. & BEDOS, A. 2000. The cave fauna of southeast Asia. Origin, evolution and ecology (pp. 603-632). In: WILKENS, H., CULVER, D.C. & HUMPHREYS, W.F. (eds). *Ecosystems of the world*, vol. 30. Subterranean ecosystems. *Elsevier, Amsterdam*, XIV + 791 pp.
- YOSHII, R. 1964. Some Collembola of the Tonga islands. *Kontyu, Tokyo*, 32: 9-17.
- YOSHII, R. 1982. Lepidocyrtid Collembola of Sabah. *Entomological Report from the Sabah Forest Research Centre* 5: 1-47.